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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/811,816
Filing Date: March 30, 2004
Appellant(s): YAMAKAWA, HIROMITSU

Bruce Y. Arnold
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 05/29/07 appealing from the Office action mailed 11/17/06.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,067,106	ISHIBE et al.	11-1999
5,991,063	ANDO	11-1999
5,671,077	IMAKAWA et al.	9-1997
5,912,768	SISSOM et al.	6-1999
5,956,070	PAOLI et al.	9-1999

(9) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishibe et al. (US Pat. 6,067,106).

Referring to claim 1:

- a laser array imaging lens in [16] shown in Fig. 9,
- a single lens component [16] (as a single lens element) with or without a stop positioned on the image side of the single lens component [16] shown in Fig. 9,
- at least one surface of the single lens component [16] is both anamorphic and aspheric (*the single lens component 16 is an anamorphic lens having both surfaces aspheric, i.e., the incident surface Ra of the lens is flat and thus aspheric while the light exit surface Rb of the lens is a toric surface,*

meaning the radius of curvature in a vertical scanning changes from an optical axis of the lens surface toward a periphery of the horizontal scanning direction) in [Col. 17, Lines 28-45],

- a diffractive optical element [24] that is either superimposed on said at least one surface or is formed on another surface of the single lens component [16], said diffractive optical element [24] in [Col. 7, Lines 31-36] being defined by a phase function in [Col. 9, Lines 9-20].

Referring to claim 9:

- the single lens component [16] consists of a single lens element [16] shown in Fig. 9.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3, 7, 11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ando (US Pat. 5,991,063) in view of Imakawa et al. (US Pat. 5,671,077).

Ando discloses the basic elements of the claimed invention. Ando teaches a laser array light source [1] in [Col. 4, lines 24-28]. Ando teaches a laser array imaging lens

[7] which receives light from the laser array light source [1], the laser array imaging lens consisting of a single lens component [7] with or without a stop positioned on the image side of the single lens component [7], with at least one surface of the single lens component being aspheric in [Col. 5, Lines 1-3] shown in Fig. 1. Ando does not teach the following condition being satisfied:

$$0.5 \prec \frac{L}{\left(D_2 \cdot \left(1 - \frac{1}{M}\right)\right)} \prec 2.0$$

where

L is the distance from the laser array light source to the light-source side of the laser array imaging lens;

D_2 is the distance along the optical axis from the image-side surface of the laser array imaging lens to the position where the centers of the beams from the laser elements of the laser array light source intersect the optical axis after being refracted by the laser array imaging lens; and

M is the image magnification.

Imakawa et al. teaches the same condition to an anamorphic and aspheric lens [21] in [Col. 15, Lines 39-44]. The lens is not the imaging lens, but the same properties are associated with an anamorphic and aspheric lens whether it is located as an imaging lens or another lens. Imakawa et al. teaches the distance (do) as 6.667mm from the laser array light source to the light-source side of the anamorphic lens [21] in [Col. 15, Lines 65-66]. Imakawa et al. teaches the distance (d2) as 18mm along the

optical axis from the second surface of the anamorphic lens to the position where the centers of the beams from the laser elements of the laser array light source intersect shown in Fig. 28A (13A is the intersection point of the centers of the beams on the optical axis) the optical axis after being refracted by the anamorphic lens [21] in [Col. 16, Lines 1-2]. Imakawa et al. teaches the image magnification (m) as 3. Therefore the following condition is met:

$$0.5 \prec \frac{6.667}{\left(18 \cdot \left(1 - \frac{1}{3}\right)\right)} \prec 2.0 \quad \Rightarrow \quad 0.5 \prec 0.555583 \prec 2.0$$

It would have been obvious .at the time the invention was made to a person having ordinary skill in the art to incorporate the anamorphic and aspheric lens characteristics of Imakawa et al. with the laser array imaging lens of Ando for the purpose of obtaining high performance in image formation.

Referring to claim 7, Ando teaches a means for independently modulating the individual light emitting elements of the laser array light source [1], based on a prescribed signal in [Col. 4, Lines 24-28, and Lines 34-36] and a means for relatively moving a surface [12] to be scanned and that is positioned substantially at the image surface of the laser array imaging lens [7], in a sub-scanning direction that is roughly perpendicular to the direction [arrow B] of the imaged dots that form one or more rows at the image surface [12] in [Col. 5, Lines 3-1t, and Lines 35-42] shown in Fig. 1.

Referring to claims 11 and 15, Ando teaches a single lens component consisting [7] of a single lens element in [Col. 5, Lines 1-3] shown in Fig. 1.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Sissom et al. (US Pat. 5,912,768).

Ishibe et al. discloses the basic elements of the claimed invention except for a stop positioned on the image side of the single lens component at a specified distance.

Sissom et al. teaches a stop [54] positioned on the image side of the single lens component imaging lens [50] at a distance away from the imaging lens [50] in [Col. 4, Lines 38-39] shown in Fig. 2.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Sissom et al. with the laser array imaging lens of Ishibe et al. for the purpose of having a specified working f-number.

6. Claims 5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Paoli et al. (US Pat. 5,956,070).

Ishibe et al. discloses the basic elements of the claimed invention. Ishibe et al. teaches a means for relatively moving a surface to be scanned which is the photosensitive drum [7], that is positioned substantially at an image surface of the laser array imaging lens [6], in a sub-scanning direction that is roughly perpendicular

to the direction [arrow B] of the image dots that form one or more rows at the image surface in [Col. 7, Lines 14-26, and Lines 43-46] shown in Fig. 2.

Ishibe et al. does not teach a laser array light source made by arraying multiple light emitting elements in one or more rows and a means for independently modulating the individual light emitting elements of the laser array light source, based on a prescribed signal.

Paoli et al. teaches a laser array light source [202] made by arraying multiple light emitting elements in one or more rows [208,210, 212, and 214] in [Col. 9, Lines 23-25] shown in Fig. 11. Paoli et al. teaches a means for independently modulating the individual light emitting elements of the laser array light source [202], based on a prescribed signal in [Col. 9, Lines 18-22].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Paoli et al. with the laser array imaging lens of Ishibe et al. for the purpose of simultaneously exposing widely separated positions on the same or different photoreceptors.

Referring to claim 13, Ishibe et al. teaches a single lens component [16] consists of a single lens element [16] shown in Fig. 9.

7. Claims 6, 10, 14, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Sissom et al. (US Pat. 5,912,768) as applied to claim 2 above, and further in view of Paoli et al. (US Pat. 5,956,070).

Ishibe et al. in view of Sissom et al. discloses the basic elements of the claimed invention. Ishibe et al. teaches a means for relatively moving a surface to be scanned which is the photosensitive drum [7], that is positioned substantially at an image surface of the laser array imaging lens [6], in a sub-scanning direction that is roughly perpendicular to the direction [arrow B] of the image dots that form one or more rows at the image surface in [Col. 7, Lines 14-26, and Lines 43-46] shown in Fig. 2.

Ishibe et al. in view of Sissom et al. does not teach a laser array light source made by arraying multiple light emitting elements in one or more rows and a means for independently modulating the individual light emitting elements of the laser array light source, based on a prescribed signal.

Paoli et al. teaches a laser array light source [202] made by arraying multiple light emitting elements in one or more rows [208,210, 212, and 214] in [Col. 9, Lines 23-25] shown in Fig. 11. Paoli et al. teaches a means for independently modulating the individual light emitting elements of the laser array light source [202], based on a prescribed signal in [Col. 9, Lines 18-22].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Paoli et al. with the laser array imaging lens of Ishibe et al. in view of Sissom et al. for the purpose of simultaneously exposing widely separated positions on the same or different photoreceptors.

Referring to claims 10 and 14, Ishibe et al. teaches a single lens component [16] consists of a single lens element [16] shown in Fig. 9.

Referring to claim 17 and 19, Ishibe et al. teaches the stop is positioned so that the laser array imaging lens is substantially telecentric on the light-source side (the stop [3] is located in the back focal plane of the imaging lens [6]) in [Col. 6, Lines 53-56] shown in Fig. 3.

8. Claims 4, 8, 12, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ando (US Pat. 5,991,063) in view of Imakawa et al. (US Pat. 5,671,077) as applied to claim 3 above, and further in view of Sissom et al. (US Pat. 5,912,768).

Ando in view of Imakawa et al. discloses the basic elements of the claimed invention except for a stop positioned on the image side of the single lens component at a specified distance.

Sissom et al. teaches a stop [54] positioned on the image side of the single lens component imaging lens [50] at a distance away from the imaging lens [50] in [Col. 4, Lines 38-39] shown in Fig. 2.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Sissom et al. with the laser array imaging lens of Ando in view of Imakawa et al. for the purpose of having a specified working f-number.

Referring to claim 8, Ando teaches Ando teaches a means for independently modulating the individual light emitting elements of the laser array light source [1], based on a prescribed signal in [Col. 4, Lines 24-28, and Lines 34-36] and a means for

relatively moving a surface [12] to be scanned and that is positioned substantially at the image surface of the laser array imaging lens [7], in a sub-scanning direction that is roughly perpendicular to the direction [arrow B] of the imaged dots that form one or more rows at the image surface [12] in [Col. 5, Lines 3-11, and Lines 35-42] shown in Fig. 1.

Referring to claims 12 and 16, Ando teaches a single lens component consisting [7] of a single lens element in [Col. 5, Lines 1-3] shown in Fig. 1.

(10) Response to Argument

Claims 1 and 9

(a) Claims 1 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishibe et al. (US Pat. 6,067,106).

In response to Appellant's argument, which states that "[t]he term "imaging lens" is well known and widely used by those of ordinary skill in the art to refer to a type of lens that is designed to have a low distortion and to image an object having an extended area so that the image faithfully resembles the object", the examiner respectfully disagrees on the basis that the term "imaging lens" as defined by the Appellant only refers to a small category of lens that has low distortion and that images an object having an extended area. The current Specification is completely silent with regard to the specific characteristic attributed to the imaging lens as stated by the Appellant, namely, the imaging lens having low distortion. On the other hand, the

examiner will not challenge the Appellant's statement with regard to the f-θ lens as being "a type of lens that is designed to have high distortion and *to image* the light source so as to form a spot of light that may be scanned by a deflector." However, it is Examiner's position that the term "imaging" associated with a lens is a well known broad term to refer to any type of lens that focuses and forms an optical image of an object on the image plane, whether the focusing/imaging by the lens is performed by scanning the light beam across the image plane or by projecting the light beam on the image plane. The f-θ lens as taught by Ishibe et al. is an imaging lens that meets all the claimed structural limitations as recited in claims 1 and 9, namely, the f-θ lens (16) in Fig. 9 is a single lens component, at least one surface of the single lens is both anamorphic and aspherical, i.e., the light exit surface Rb is toric, a diffractive optical element (24) is surperimposed on another surface of the single lens, i.e., on the light entrance surface Ra of the lens, and said diffractive optical element being defined by a phase function. The structure of the imaging lens as currently claimed in claims 1 and 9 is thus not distinguishable from that of the f-θ lens as taught by Ishibe et al.

In response to Appellant's argument regarding the "f-θ lenses which, due to their high distortion, are entirely unsuitable for imaging a laser array", the examiner respectfully disagrees. Not only, the f-θ lenses are not limited to image a single light source, but also the f-θ lenses are well known in the art to perfectly perform the scanning and imaging of the light beams emitted from a plurality of laser light sources or laser array, as evidenced by another cited reference in Ando (US 5,671,077), which

teaches a single scanning lens having f-θ characteristics being used to image the light beams emitted by a laser array:

> *"Referring to FIG. 1, a monolithic multi-beam laser element 1 serves as a light source means, and comprises a surface-emission laser"* (emphasis added) [Ando: col. 4, lines 23-25]
>
> *A scanning lens system 7 serves as an imaging means, and comprises a single anamorphic lens (scanning lens) using a plastic aspherical surface. The scanning lens 7 has, in a scanning plane (main scanning direction), so-called f-θ characteristics for imaging light beams which are deflected and incident at equal angular velocities into beam spots that move at equal velocities on scanning lines 8 and 9 (to be described later)."* (emphasis added) [Ando: col. 5, lines 8].

The Appellant further argues that (i) "line 1 of claim 1 contains the limitation "A laser array imaging lens" and (ii) "As claim 9 is a dependent claim that depends from claim 1, it includes the limitation "A laser array imaging lens". It is noted that the limitation with regard to the "laser array" occurs only in the preamble to merely recite the purpose of the intended use of the lens structure, and is never referred back in the body of the respective claims 1 and 9. In other words, the recited limitation of "laser array" in the preamble does not have an effect on the claimed structure of the imaging lens as recited in claims 1 and 9, and thus does not limit the claimed structure of the imaging lens. Therefore, in response to Appellant's arguments, the recitation of the "laser array" has not been given patentable weight because the recitation occurs in the

preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Claims 3, 7, 11 and 15

(b) Claims 3, 7, 11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ando (US Pat. 5,991,063) in view of Imakawa et al. (US Pat. 5,671,077).

In response to Appellant's argument, which states that "[t]he term "imaging lens" is well known and widely used by those of ordinary skill in the art to refer to a type of lens that is designed to have a low distortion and to image an object having an extended area so that the image faithfully resembles the object", the examiner respectfully disagrees on the basis that the term "imaging lens" as defined by the Appellant only refers to a small category of lens that has low distortion and that images an object having an extended area. The current Specification is completely silent with regard to the specific characteristic attributed to the imaging lens as stated by the Appellant. The examiner will not challenge the Appellant's statement with regard to the f-θ lens as being "a type of lens that is designed to have high distortion and *to image* the light source so as to form a spot of light that may be scanned by a deflector."

However, it is Examiner's position that the term "imaging" associated with a lens is a well known broad term to refer to any type of lens that focuses and forms an optical image of an object on the image plane, whether the focusing/imaging by the lens is performed by scanning the light beam across the image plane or by projecting the light beam on the image plane. Moreover, the structure of the imaging lens as currently claimed is not distinguishable from that of the f-θ lens as taught by Ando, which teaches the single f-θ lens (7) serving as an imaging lens for receiving light from the multi-beam laser light source (1), the f-θ lens having an aspherical surface.

In response to Appellant's argument regarding the "f-θ lenses which, due to their high distortion, are entirely unsuitable for imaging a laser array", the examiner respectfully disagrees. Not only, the f-θ lenses are not limited to image a single light source, but also the f-θ lenses are well known in the art to perfectly perform the scanning and imaging of the light beams emitted from a plurality of laser light sources or laser array. And to the contrary of Appellant's statement, the cited art in Ando (US 5,671,077) teaches a single scanning lens having f-θ characteristics being used to image the light beams emitted by a laser array:

> *"Referring to FIG. 1, a monolithic multi-beam laser element 1 serves as a light source means, and comprises a surface-emission laser"* (emphasis added) [Ando: col. 4, lines 23-25]
>
> *A scanning lens system 7 serves as an imaging means, and comprises a single anamorphic lens (scanning lens) using a plastic aspherical surface. The scanning lens 7 has, in a scanning plane (main scanning direction), so-called f-*

θ characteristics for imaging light beams which are deflected and incident at equal angular velocities into beam spots that move at equal velocities on scanning lines 8 and 9 (to be described later)." (emphasis added) [Ando: col. 5, lines 8].

The Appellant further argues that (i) "line 3 of claim 3 contains the limitation "a laser array imaging lens", (ii) "as each of claims 7, 11 and 15 are dependent claims that depend (directly or indirectly) from claim 3, each includes the limitation "a laser array imaging lens" and (iii) "the combined teachings of Ando and Imakawa et al. would not make obvious a "laser array imaging lens"". However, contrary to Appellant's arguments, Ando clearly teaches the f-θ lens 7 being served as an imaging lens for imaging the light beams emitted from a multi-beam laser light source meaning a laser array light source (see Ando, col. 4, lines 23-25 and col. 5, lines 1-8).

Claim 2

(c) Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Sissom et al. (US Pat. 5,912,768).

In response to Appellant's arguments that claim 2 also contains the limitation of "A laser imaging lens" as in claim 1 and that Ishibe et al. fails to teach the imaging lens being used with a laser array, the examiner respectfully note that the recitation of the "laser array" has not been given patentable weight because the recitation occurs in the preamble since it does not have an effect on the claimed structure of the imaging lens as recited in claim 2. A preamble is generally not accorded any patentable weight

where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Claims 5 and 13

(d) Claims 5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Paoli et al. (US Pat. 5,956,070).

In response to Appellant's arguments that each of claims 5 and 13 also includes the limitation of "A laser imaging lens" as recited in line 1 of claim 1 and that Ishibe et al. fails to teach the imaging lens being used with a laser array, the examiner respectfully note that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The examiner fails to see any distinction in the claimed laser-array imaging lens since the *structure* of the imaging lens as claimed by the Appellant is identical to that of the prior art in Ishibe et al. Moreover, the f-θ lens of Ishibe et al. is capable of performing the intended use as evidenced by Ando, therefore, the teaching of Ishibe et al. meets the claim limitations.

Claims 6, 10, 14, 17 and 19

(e) Claims 6, 10, 14, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibe et al. (US Pat. 6,067,106) in view of Sissom et al. (US Pat. 5,912,768) as applied to claim 2 above, and further in view of Paoli et al. (US Pat. 5,956,070).

In response to Appellant's arguments that each of the claims 6, 10, 14, 17 and 19 also includes the limitation of "A laser imaging lens" as recited in line 1 of claim 1 and that Ishibe et al. fails to teach the imaging lens being used with a laser array, the examiner respectfully note that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The examiner fails to see any distinction in the claimed laser-array imaging lens since the *structure* of the imaging lens as claimed by the Appellant is identical to that of the prior art in Ishibe et al. Moreover, the f-θ lens of Ishibe et al. is capable of performing the intended use as evidenced by Ando, therefore, the teaching of Ishibe et al. meets the claim limitations.

Claims 4, 8, 12 and 16

(f) Claims 4, 8, 12, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ando (US Pat. 5,991,063) in view of Imakawa et al. (US Pat.

5,671,077) as applied to claim 3 above, and further in view of Sissom et al. (US Pat. 5,912,768).

Appellant argues that claims 4, 8, 12 and 16 including the limitation "a laser array imaging lens" and that "Ando discloses an f-θ lens that would not be suitable for imaging a laser array. The examiner respectfully disagrees. To the contrary of Appellant's statement, the cited art in Ando (US 5,671,077) teaches a single scanning lens having f-θ characteristics being used to image the light beams emitted by a laser array:

> *"Referring to FIG. 1, a monolithic multi-beam laser element 1 serves as a light source means, and comprises a surface-emission laser"* (emphasis added) [Ando: col. 4, lines 23-25]
>
> *A scanning lens system 7 serves as an imaging means, and comprises a single anamorphic lens (scanning lens) using a plastic aspherical surface. The scanning lens 7 has, in a scanning plane (main scanning direction), so-called f-θ characteristics for imaging light beams which are deflected and incident at equal angular velocities into beam spots that move at equal velocities on scanning lines 8 and 9 (to be described later)."* (emphasis added) [Ando: col. 5, lines 8].

Therefore, the teaching of Ando meets the claim limitation recited in claims 4, 8, 12 and 16.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Examiner Hai C. Pham

August 28, 2007

Conferees:

Matthew Luu

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